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**Hematopoietic stem cell: self-renewal versus differentiation.**

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**Public Summary:**

Blood forming system is one of the most complicated system in our body. Everyday, more than 10 distinct types of blood cells are generated from one specific cell type, hematopoietic stem cells, through multiple steps of cell division and maturation. This process is called differentiation. Interestingly, hematopoietic stem cell also provide itself when a stem cell divide into two daughter cells without differentiation. This ability is called self-renewal. In the blood forming system, hematopoietic stem cells take balance between self-renewal and differentiation to maintain proper blood formation throughout our life. We reviewed current understanding of the structure of blood forming system and molecular mechanisms regulating self-renewal and differentiation of hematopoietic stem cell.

**Scientific Abstract:**

The mammalian blood system, containing more than 10 distinct mature cell types, stands on one specific cell type, hematopoietic stem cell (HSC). Within the system, only HSCs possess the ability of both multipotency and self-renewal. Multipotency is the ability to differentiate into all functional blood cells. Self-renewal is the ability to give rise to HSC itself without differentiation. Since mature blood cells (MBCs) are predominantly short-lived, HSCs continuously provide more differentiated progenitors while properly maintaining the HSC pool size throughout life by precisely balancing self-renewal and differentiation. Thus, understanding the mechanisms of self-renewal and differentiation of HSC has been a central issue. In this review, we focus on the hierarchical structure of the hematopoietic system, the current understanding of microenvironment and molecular cues regulating self-renewal and differentiation of adult HSCs, and the currently emerging systems approaches to understand HSC biology.

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